

# KANSAS STATE FIRE MARSHAL'S OFFICE

FIRE PREVENTION DIVISION  
ABOVEGROUND TANK PROGRAM  
700 SW JACKSON SUITE 600  
TOPEKA, KANSAS 66603-3714  
785-296-3401



Summary of Aboveground Storage Tank  
Requirement & Regulations  
For Flammable/Combustible Liquids

## STORAGE

All flammable and combustible liquids shall be stored in approved portable containers or aboveground or underground tanks. These containers shall be approved for such use and listed by Underwriters Laboratories (UL).

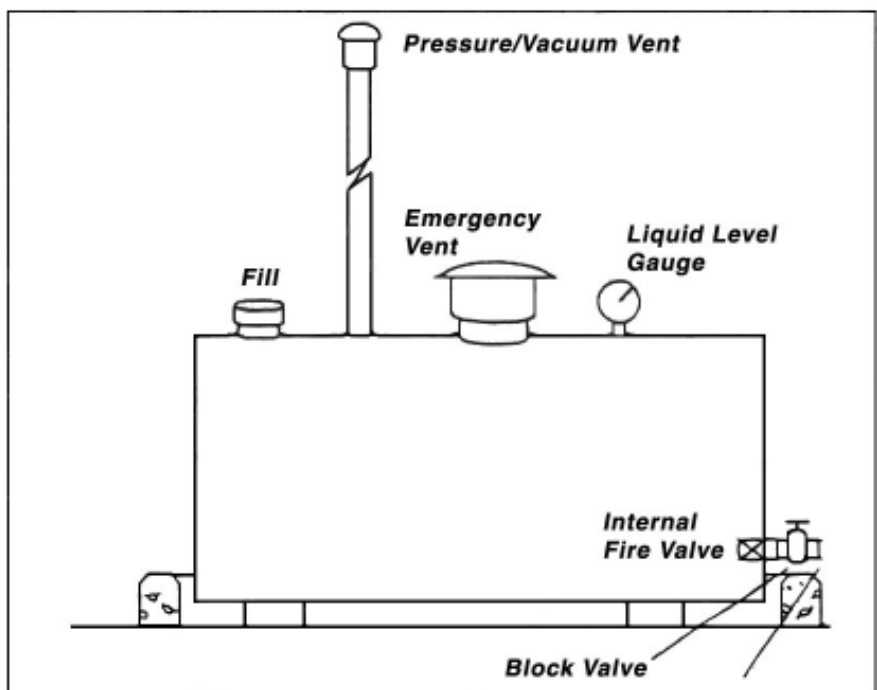
### Tank Configuration

Aboveground storage tanks may be either verticle or horizontal, and located on the ground, elevated, or in vaults, above or below ground. All aboveground storage tanks of 660 gallons or more capacity in industrial, business or governmental facilities, tanks of 1,100 gallons or more on any agricultural farm installation or any tank installed for retail sale of flammable or combustible liquids must set on a firm foundation, typically a concrete slab. Elevated tanks higher than 12 inches above the foundation must have a minimum fire rating of two hours and be constructed of concrete, masonry, or protected steel.

Aboveground tanks must be constructed to the UL 142 standard. Tanks designed for underground use may not be used for aboveground unless their suitability for aboveground use is confirmed by the manufacturer. Tanks may be designed as a single wall unit which will require a secondary containment area, as a single wall unit with a steel secondary containment area, or as a multi-wall unit constructed of composites of steel, plastic, and concrete. The space between the walls may be filled with concrete or other fire-retardant materials or be open to permit interstitial monitoring. Tanks without an open interstice are considered single-wall.

### Tank Openings

Tank openings are required for product inlet, outlet, venting and level measurement. All tanks shall be outfitted with an appropriate sized emergency vent, a working or pressure vent to 12 feet above grade level, a securable block valve, and a fire valve (see Figure 1). A fire valve shall be installed at any tank opening through which stored product could flow by gravity.



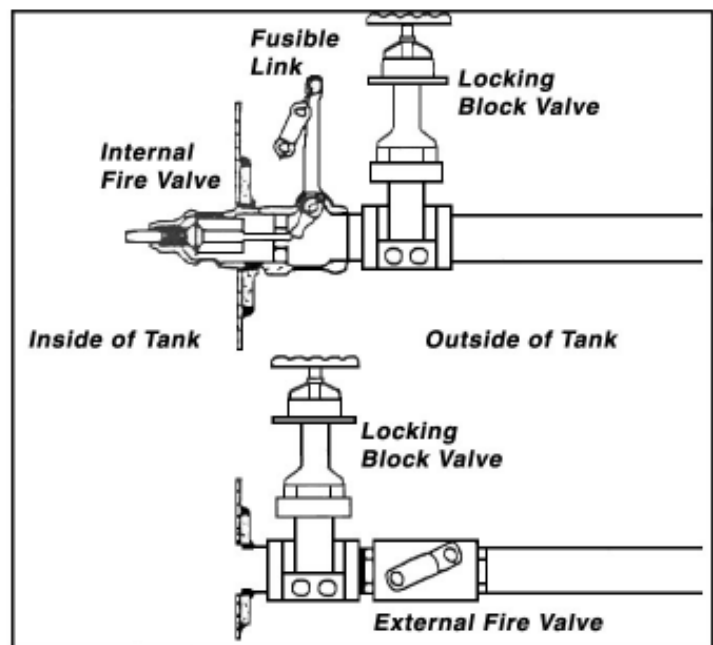
**Figure 1 Tank Openings**

## Fire Valves

Fire valves may be internal or external to the tank and must have a fusible link as shown in Figure 2 at the right.

## Dikes

Dikes shall be provided with an impervious barrier to contain any spills, leaks or failure of the tank. The containment shall be at least 110 percent of the largest tank within the diked area after deducting the volume of other tanks below the height of the dike wall.



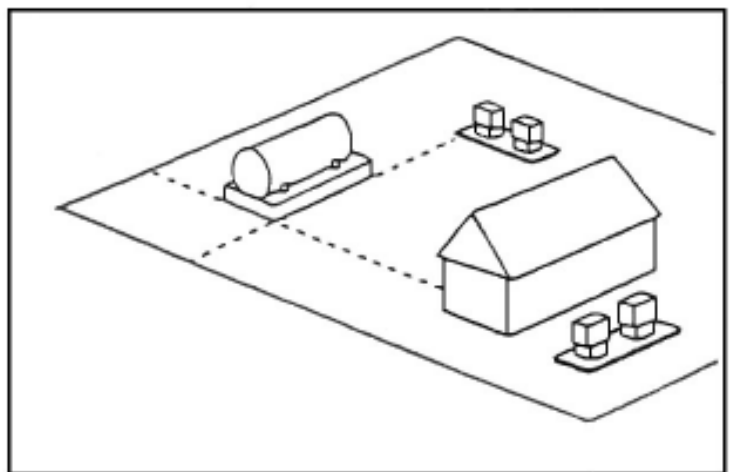
**Figure 2 Fire Valves**

## Tank Spacing

To allow passage between tanks for inspection, a minimum spacing equivalent to  $1/6$  of the sum of the adjacent tank diameters, but not less than three feet, is required. Additional space is required for dikes, fencing and to provide access to valves, piping, pumps and controls.

## Tank Location

Aboveground tanks will occupy a substantial space and restrict the use of the site for other activities. Generally, a site at the rear of the facility, clear of traffic and service areas is most desirable. Requirements of adopted National Fire Protection Association pamphlet 30 Flammable and Combustible Liquids Code 1990 edition and National Fire Protection Association pamphlet 30A Automotive and Marine Service Station code



**Figure 3 Tank Location**

establishes the minimum distances from property lines, dispensers, buildings, and transfer points restrict where tanks may be located.

Other restrictions may include any set back requirements by the Kansas Department of Transportation, codes or ordinances adopted by the local city or county and planning or zoning commissions.

# TRANSFER

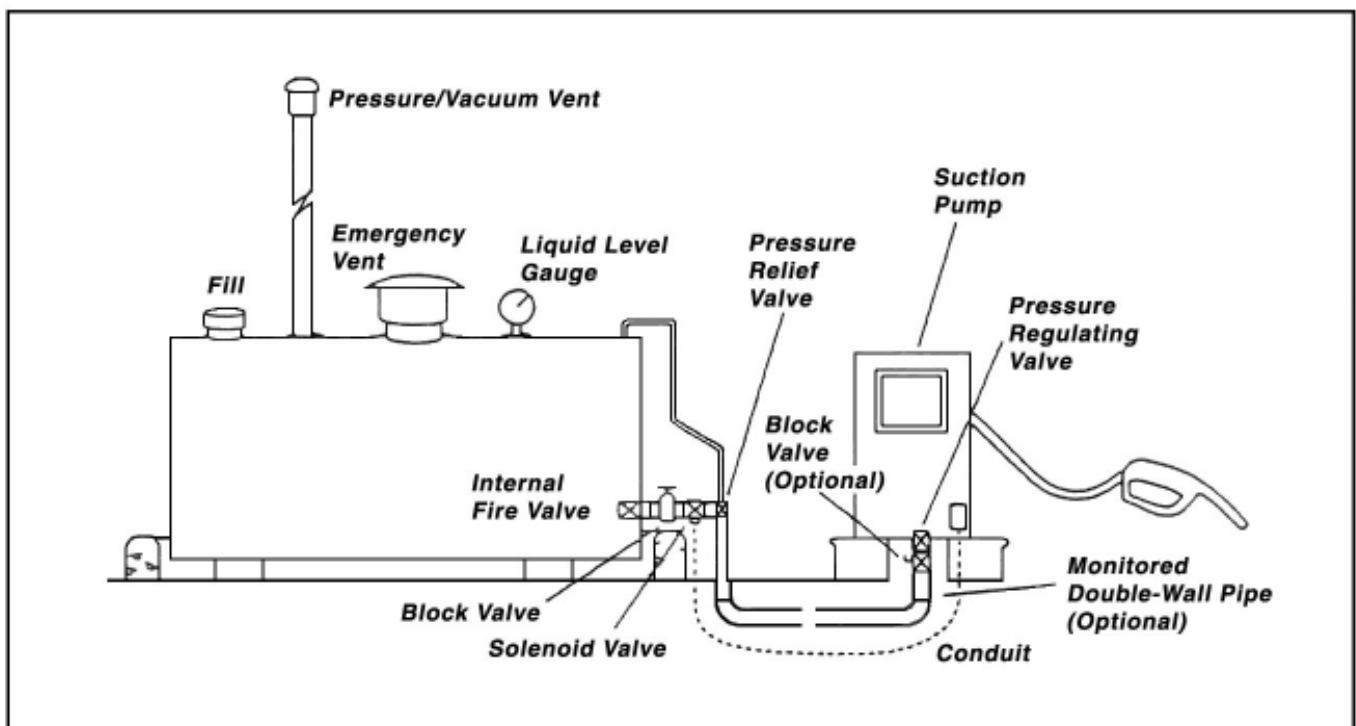
## Product Deliveries

Product deliveries to aboveground tanks are filled from pumping systems, located either on board the delivery transport or as a fixed component of the facility. The fill connection point should be located to provide clear visibility of the tanks during delivery. Transports should maintain a minimum distance of 25 feet from the storage tanks when off-loading product. There should also be spill containment, capable of holding the maximum quantity of product contained in the transfer hose.

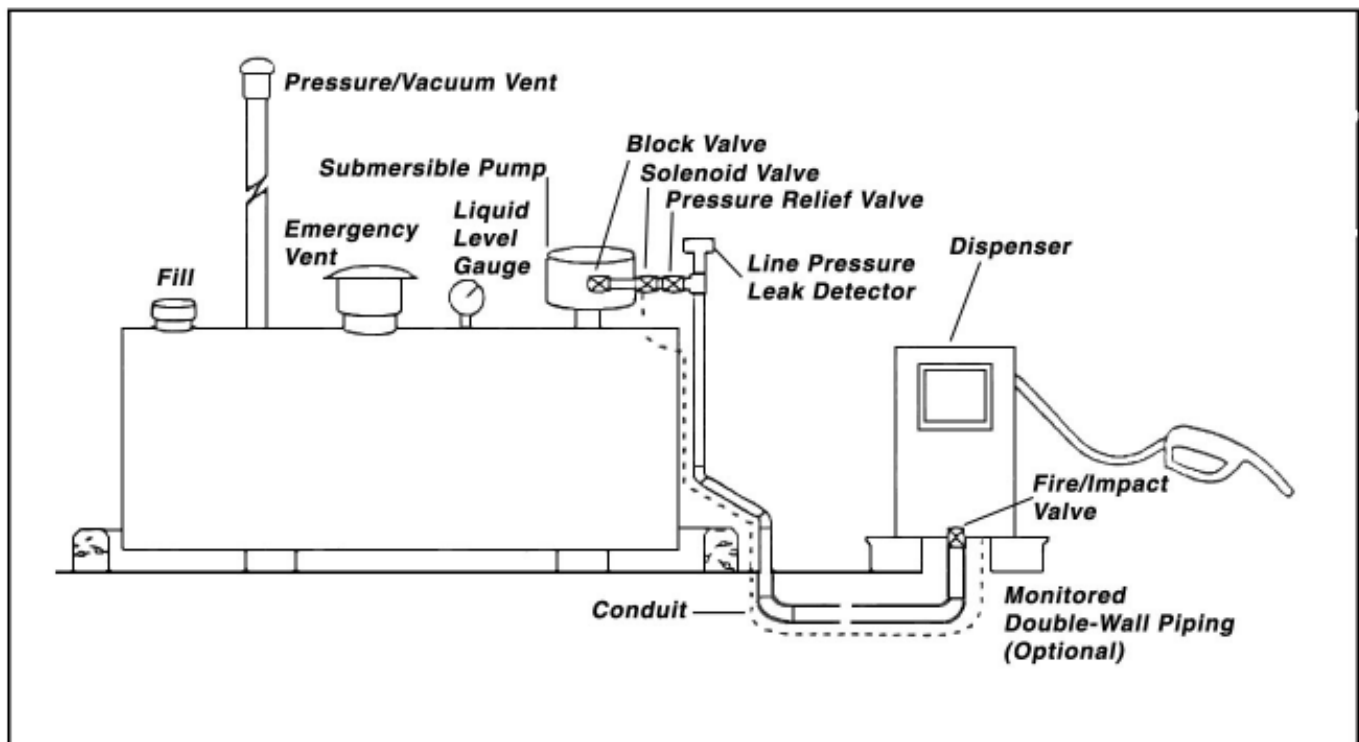
## Dispensing Islands

Dispensers should be mounted on raised islands with adequate collision protection provided. All dispensers shall be provided with either a fire/impact valve or a pressure regulating valve with shear capabilities to prevent product spillage, should a dispenser be separated from its foundation by a collision.

When a dispenser is separated remotely from the tank a normally-closed, an explosion-proof solenoid valve shall be installed. It is designed to open and close with the operation of the pump motor. See figures 4 and 5 for system installation. Dispensers/suction pumps mounted directly to the top of a tank are not required to install a solenoid valve (see figure 6) but these types of installations are not permitted for retail sale of fuels. All dispenser discharge hoses shall be quipped with an emergency breakaway device designed to retain liquid on both sides of the breakaway point.



**Figure 4 Suction System**

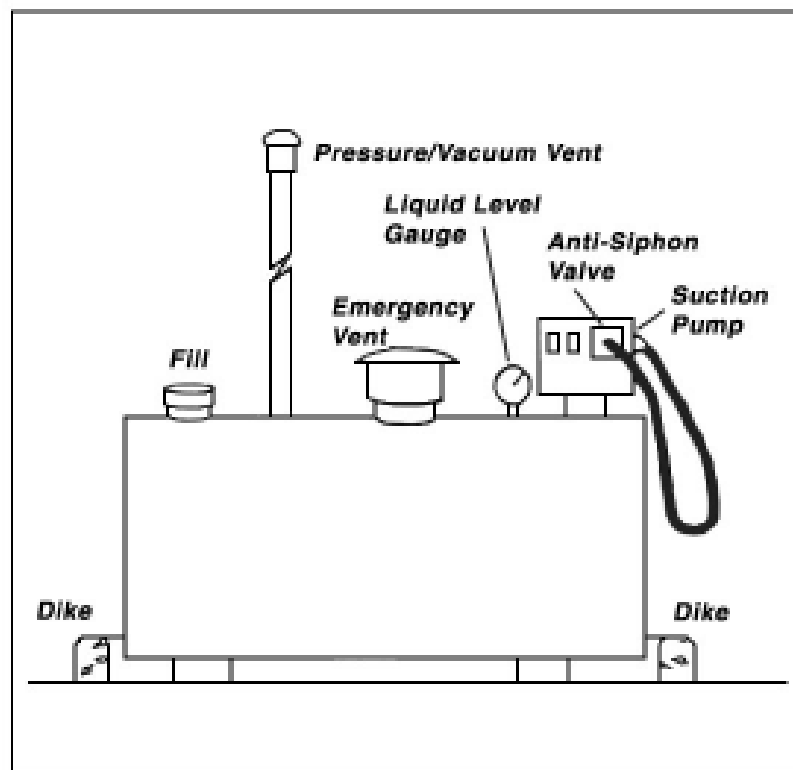


**Figure 5 Remote Pump System**

## OPERATIONS

Any individual conducting the transfer of flammable or combustible liquids from a transport vehicle to a storage tank shall verify the available capacity of the tank prior to starting transfer operations. Proper electrical bonding shall be provided at all facilities where tank vehicles are loaded through open domes.

Each employee at a retail service station shall annually receive training on the proper procedures to be used in case of fire, overfill, or fuel spill situation. Such training shall include improper transfer of fuels, types of improper and illegal containers, and instruction on the proper use of fire extinguishers. Documentation of such training shall be maintained and be available for inspection.



**Figure 6 Tank-Mounted Suction System**

# **PREVENTION**

## **Fire Protection**

Risk of fire or explosion is greater at aboveground tank sites than at underground tank sites. Set-back and separation requirements are intended to reduce the risk of exposure from fire to other buildings, vehicles, storage tanks, and to provide room for fire fighters to work. Some communities may have additional or more restrictive requirements than those administered by the Kansas State Fire Marshal.

## **Fire Extinguisher**

Each service station shall provide at least one 40BC rated fire extinguisher. Unattended service stations shall install the extinguisher within 100 feet of the dispensers. NOTE: Convenience stores shall have at least one 2A-40BC rated fire extinguisher.

## **Signage**

Islands dispensing Class I liquids shall have warning signs with the following equivalent wording:

- (1) NO SMOKING
- (2) STOP ENGINE or MOTOR
- (3) IT IS UNLAWFUL AND DANGEROUS TO DISPENSE GASOLINE INTO UNAPPROVED CONTAINERS.

Island dispensing ONLY Class II liquids shall have "NO SMOKING" signs.

## **Attended Self-Service Stations Additional Requirements**

All attended self-service stations shall have at least one attendant on duty while station is open for business. Attended self-service stations shall provide an emergency shut off control at the attendant's console. The dispensing area shall at all times be in clear view of the attendant OR shall have a two-way intercom which monitors island activity.

## **Unattended Self-Service Station Additional Requirements**

All unattended self-service stations shall provide emergency controls to shut off all power to all dispensing devices and shall be located within 100 feet of all dispensers.

Operating instructions shall be posted and visible in the dispensing area and include the following information:

- (1) Location of emergency shut off (unless obvious); and
- (2) Location of fire extinguisher (unless obvious); and
- (3) Emergency instructions which incorporate the following or equivalent wording:

Company Name

IN CASE OF FIRE OR SPILL

Use emergency shut off

Report to:

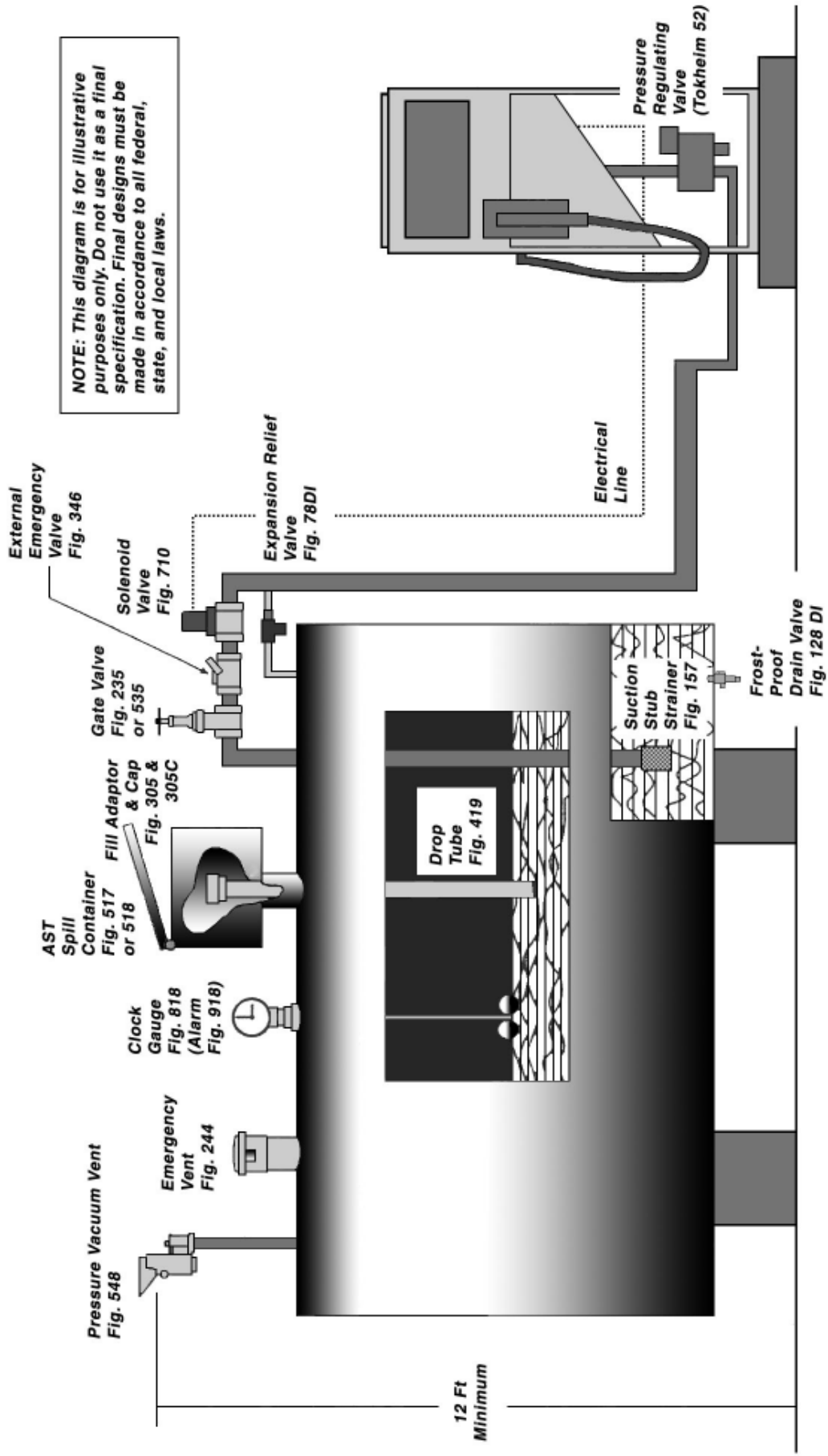
(Company emergency telephone number)

(Local fire department telephone number)

An on-site telephone OR clearly understood posted instructions of how to notify the fire department shall be provided on site.

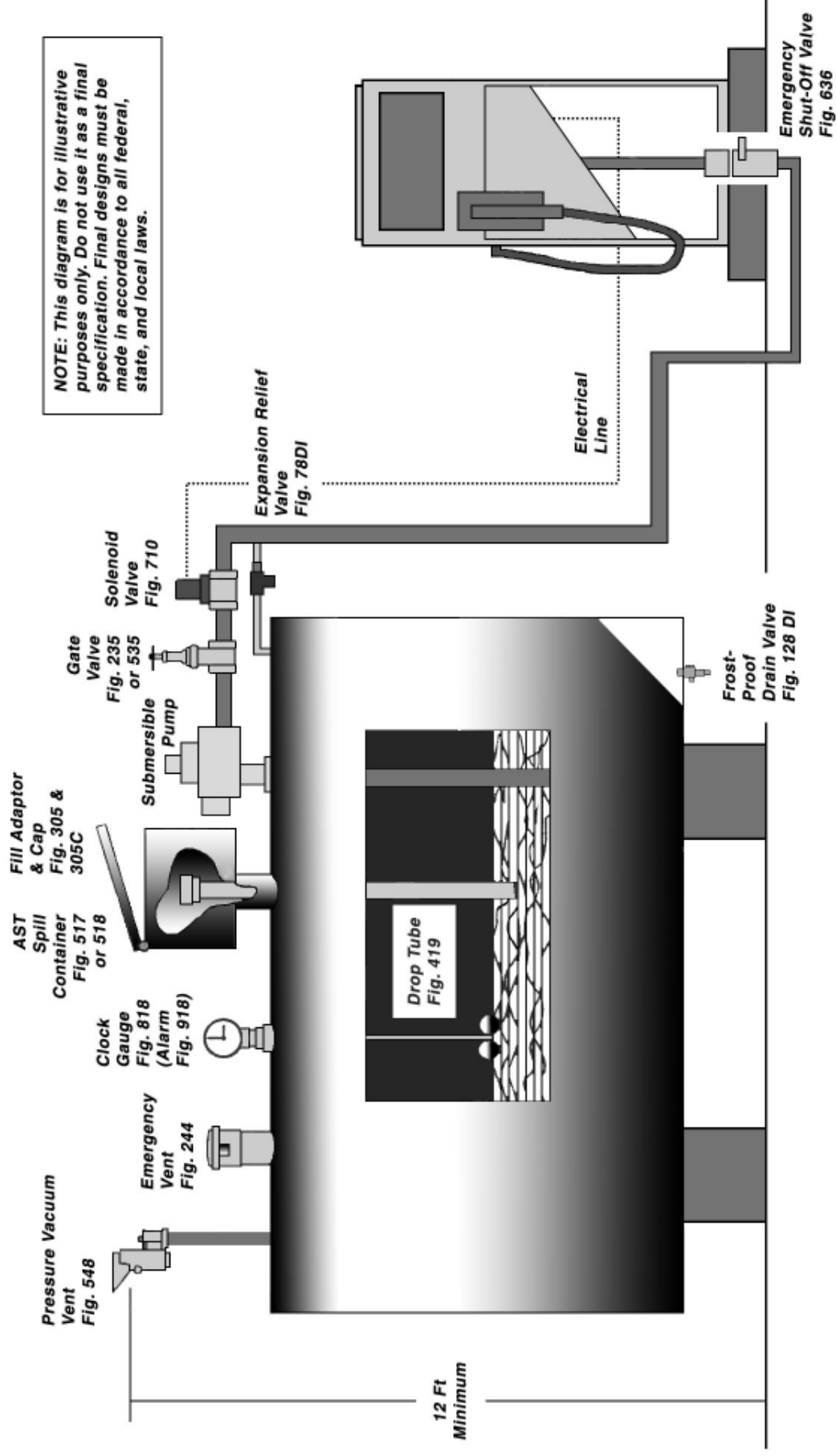
All illustrations are reprinted with the expressed written consent of the Petroleum Equipment Institute, P.O. Box 2380 Tulsa, Oklahoma, 74101-2380 from RP200-92 Recommended Practices for Installation of Aboveground Storage Systems for Motor Vehicle Fueling.

# Aboveground Fuel Storage - Suction System





# Aboveground Fuel Storage - Pressure System



# PROPER DISPENSER INSTALLATION

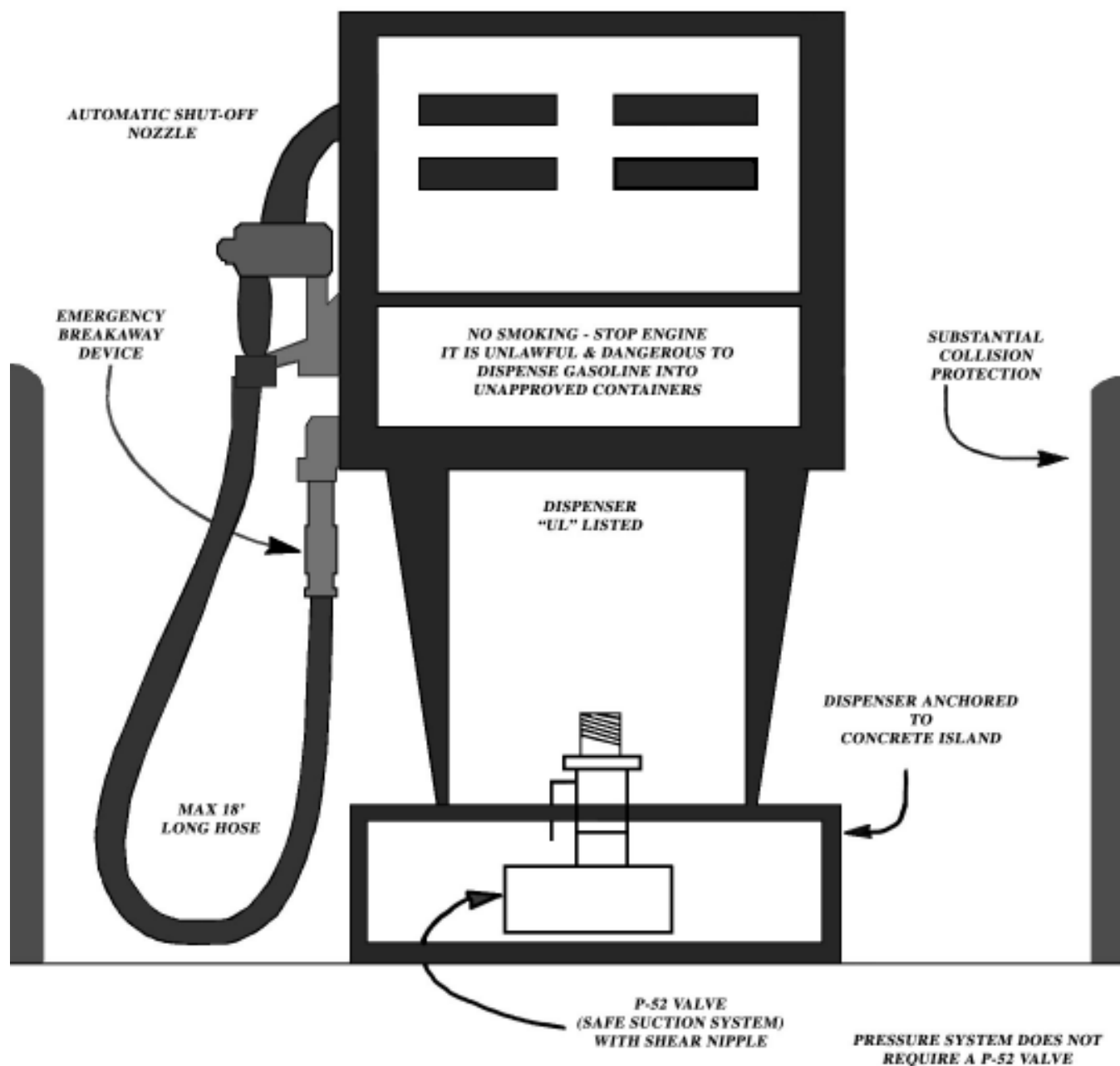


Table 2.3.2.1.1(a) Stable Liquids [Operating Pressure 2.5 psig (gauge pressure of 17.2 kPa) or Less]

Type of Tank	Protection	Minimum Distance in Feet from Property Line that Is or Can Be Built Upon, Including the Opposite Side of a Public Way, and Shall Not Be Less than 5 ft	Minimum Distance in Feet from Nearest Side of Any Public Way or from Nearest Important Building on the Same Property and Shall Not Be Less than 5 ft
Floating roof	Protection for exposures <sup>1</sup>	$1/2$ times diameter of tank	$1/6$ times diameter of tank
	None	Diameter of tank but need not exceed 175 ft	$1/6$ times diameter of tank
Vertical with weak roof-to-shell seam	Approved foam or inerting system <sup>2</sup> on tanks not exceeding 150 ft in diameter <sup>3</sup>	$1/2$ times diameter of tank	$1/6$ times diameter of tank
	Protection for exposures <sup>1</sup>	Diameter of tank	$1/3$ times diameter of tank
	None	2 times diameter of tank but need not exceed 350 ft	$1/3$ times diameter of tank
Horizontal and vertical tanks with emergency relief venting to limit pressures to 2.5 psig (gauge pressure of 17.2 kPa)	Approved inerting system <sup>2</sup> on the tank or approved foam system on vertical tanks	$1/2$ times Table 2.3.2.1.1(b)	$1/2$ times Table 2.3.2.1.1(b)
	Protection for exposures <sup>1</sup>	Table 2.3.2.1.1(b)	Table 2.3.2.1.1(b)
	None	2 times Table 2.3.2.1.1(b)	Table 2.3.2.1.1(b)

For SI units, 1 ft = 0.3 m.

<sup>1</sup>See definition 1.6.38, Protection for Exposures.<sup>2</sup>See NFPA 69, *Standard on Explosion Prevention Systems*.<sup>3</sup>For tanks over 150 ft in diameter, use "Protection for Exposures" or "None," as applicable.

Table 2.3.2.1.1(b) Reference Table for Use in Tables 2.3.2.1.1(a), 2.3.2.1.2, 2.3.2.1.3, and 2.3.2.1.4

Tank Capacity (gal)	Minimum Distance from Property Line that Is or Can Be Built Upon, Including the Opposite Side of a Public Way (ft)	Minimum Distance from Nearest Side of Any Public Way or from Nearest Important Building on the Same Property (ft)
275 or less	5	5
276 to 750	10	5
751 to 12,000	15	5
12,001 to 30,000	20	5
30,001 to 50,000	30	10
50,001 to 100,000	50	15
100,001 to 500,000	80	25
500,001 to 1,000,000	100	35
1,000,001 to 2,000,000	135	45
2,000,001 to 3,000,000	165	55
3,000,001 or more	175	60

For SI units, 1 ft = 0.3 m; 1 gal = 3.8 L.

Table 2.3.2.1.2 Stable Liquids [Operating Pressure Greater than 2.5 psig (gauge pressure of 17.2 kPa)]

Type of Tank	Protection	Minimum Distance in Feet from Property Line that Is or Can Be Built Upon, Including the Opposite Side of a Public Way	Minimum Distance in Feet from Nearest Side of Any Public Way or from Nearest Important Building on the Same Property
Any type	Protection for exposures <sup>2</sup>	$1 1/2$ times Table 2.3.2.1.1(b) but shall not be less than 25 ft	$1 1/2$ times Table 2.3.2.1.1(b) but shall not be less than 25 ft
	None	3 times Table 2.3.2.1.1(b) but shall not be less than 50 ft	$1 1/2$ times Table 2.3.2.1.1(b) but shall not be less than 25 ft

For SI units, 1 ft = 0.3 m.

<sup>2</sup>See definition 1.6.38, Protection for Exposures.

Table 2.3.2.1.3 Boil-Over Liquids

Type of Tank	Protection	Minimum Distance in Feet from Property Line that Is or Can Be Built Upon, Including the Opposite Side of a Public Way, and Shall Not Be Less than 5 ft	Minimum Distance in Feet from Nearest Side of Any Public Way or from Nearest Important Building on the Same Property and Shall Not Be Less than 5 ft
Floating roof [see Table 2.3.2.1.1(a)]	Protection for exposures <sup>1</sup>	$\frac{1}{2}$ times diameter of tank	$\frac{1}{6}$ times diameter of tank
	None	Diameter of tank	$\frac{1}{6}$ times diameter of tank
Fixed roof	Approved foam or inerting system <sup>2</sup>	Diameter of tank	$\frac{1}{3}$ times diameter of tank
	Protection for exposures <sup>1</sup>	2 times diameter of tank	$\frac{2}{3}$ times diameter of tank
	None	4 times diameter of tank but need not exceed 350 ft	$\frac{2}{3}$ times diameter of tank

For SI units, 1 ft = 0.3 m.

<sup>1</sup>See definition 1.6.38, Protection for Exposures.<sup>2</sup>See NFPA 69, *Standard on Explosion Prevention Systems*.

Table 2.3.2.1.4 Unstable Liquids

Type of Tank	Protection	Minimum Distance in Feet from Property Line that Is or Can Be Built Upon, Including the Opposite Side of a Public Way	Minimum Distance in Feet from Nearest Side of Any Public Way or from Nearest Important Building on the Same Property
Horizontal and vertical tanks with emergency relief venting to permit pressure not in excess of 2.5 psig (gauge pressure of 17.2 kPa)	Tank protected with any one of the following: approved water spray, approved inerting, <sup>1</sup> approved insulation and refrigeration, approved barricade	Table 2.3.2.1.1(b) but not less than 25 ft	Not less than 25 ft
	Protection for exposures <sup>2</sup>	$2\frac{1}{2}$ times Table 2.3.2.1.1(b) but not less than 50 ft	Not less than 50 ft
	None	5 times Table 2.3.2.1.1(b) but not less than 100 ft	Not less than 100 ft
Horizontal and vertical tanks with emergency relief venting to permit pressure over 2.5 psig (gauge pressure of 17.2 kPa)	Tank protected with any one of the following: approved water spray, approved inerting, <sup>1</sup> approved insulation and refrigeration, approved barricade	2 times Table 2.3.2.1.1(b) but not less than 50 ft	Not less than 50 ft
	Protection for exposures <sup>2</sup>	4 times Table 2.3.2.1.1(b) but not less than 100 ft	Not less than 100 ft
	None	8 times Table 2.3.2.1.1(b) but not less than 150 ft	Not less than 150 ft

For SI units, 1 ft = 0.3 m.

<sup>1</sup>See NFPA 69, *Standard on Explosion Prevention Systems*.<sup>2</sup>See definition 1.6.38, Protection for Exposures.

**2.3.2.1.5** Tanks storing Class IIIB stable liquids shall be located in accordance with Table 2.3.2.1.5.

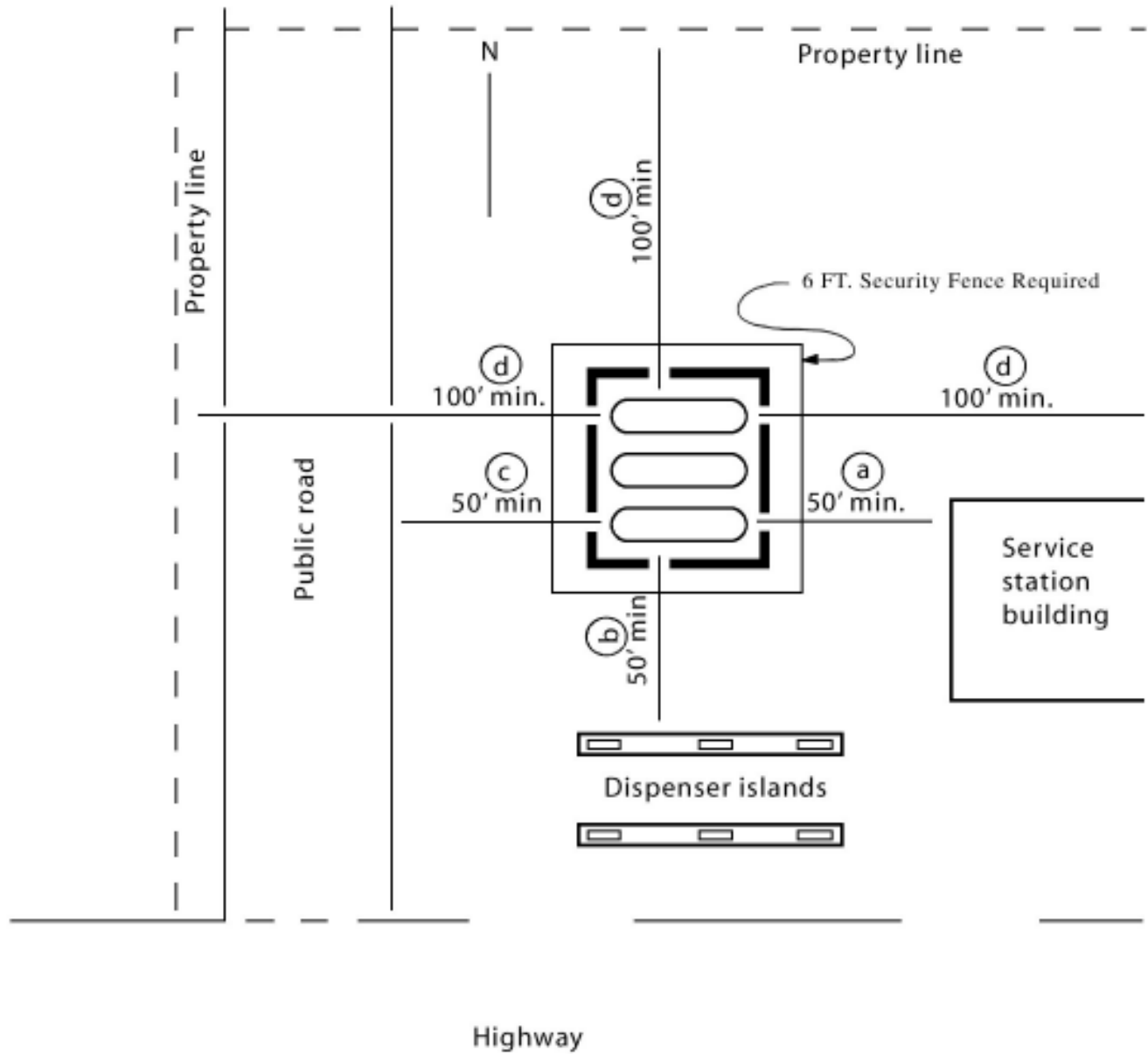
*Exception:* If located within the same diked area as or the drainage path of a tank storing a Class I or Class II liquid, the tank storing Class IIIB liquid shall be located in accordance with 2.3.2.1.1.

**2.3.2.1.6** Where two tank properties of diverse ownership have a common boundary, the authority having jurisdiction

shall be permitted, with the written consent of the owners of the two properties, to substitute the distances provided in 2.3.2.2 for the minimum distances set forth in 2.3.2.1.

**2.3.2.1.7** Where end failure of a horizontal pressure tank or vessel can expose property, the tank or vessel shall be placed with its longitudinal axis parallel to the nearest important exposure.

**TANK PLACEMENT  
FOR  
RETAIL SALES FACILITIES**



areas subject to flooding from flotation. The accumulation of rainwater within a dike may be sufficient to cause movement of the tank. The tank should be secured to a foundation or restraining pad with sufficient weight to prevent flotation at maximum anticipated flood stage with the tank empty. The amount of weight required is determined by multiplying the capacity of the tank, below maximum anticipated flood stage, by the weight of water (8.3 pounds per gallon), and subtracting the weight of the tank, equipment, and attached supports. Responsibility for the design of the concrete pad beneath the tank and determination of the method of anchoring should be assigned to an adequately qualified individual.

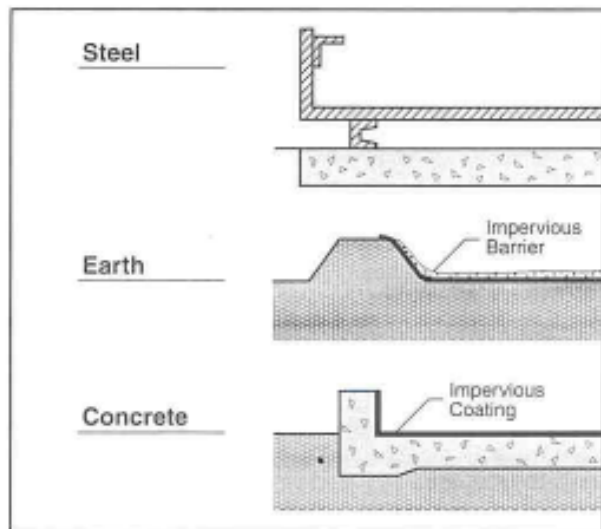
## 4. DIKES

**4.1 Purpose.** Dikes around aboveground tanks and associated piping are designed to contain product spills and releases from tanks, piping, and associated equipment. Dikes should contain accidental spills and prevent them from entering the ground. Uncontained spills might be ignited and cause the spread of fire or contaminate the environment. In any case, uncontained spills are dangerous and difficult to control.

**4.2 Sources of Releases.** Leaks in aboveground storage systems can result from loose fittings, corrosion, thermal stress, structural failure, or collision. Spills may occur when delivery hoses are disconnected, when tanks are overfilled, or when vandalism occurs. Major failures may result from intense heat from a fire, or from stress created by seismic or hurricane forces.

**4.3 Dike Capacity.** A dike must be able to hold the greatest volume of product that may be released by the largest tank within the dike. Additional dike capacity may be required to allow for rainwater accumulation in the dike or to provide an additional margin of safety. Where the diked area encloses more than one tank, the volume occupied by the additional tank(s) in the dike is not available to contain a release from the largest tank. Because of this, the volume occupied by the portion of the additional tank(s) that is lower than the dike wall must be taken into account when determining dike capacity. A detailed explanation of how to calculate dike capacity is presented in Appendix A.

**4.4 Dike Construction.** Dike walls may be constructed of earth, steel, concrete, or solid masonry. Dike walls should be liquid tight, impervious to the liquid stored, and capable of withstanding the hydrostatic pressure of the contained liquid when full. The outside base of the dike should be no closer than 10 feet from any property line that is, or can be, built upon to permit access for fire fighting and to protect adjacent buildings. Earthen dike walls three feet or more in height should have a flat top surface at least two feet wide. The slope of an earthen dike wall should not exceed the angle of repose of the material used to construct the dike. Steel dikes may be an integral part of the tank.



**Figure 7. Typical Dike Sections.** Dikes may be constructed of steel, earth or concrete.

**4.5 Impervious Barrier.** The walls and bottom of a diked area may consist of specially formulated and well-compacted clay, solid pavement, coatings, or impervious membrane liners. Concrete, with an additive to make it impervious, may be used. Materials should be specifically designed and tested to ensure compliance with environmental standards. Install coatings and liners in accordance with the manufacturer's instructions.

**4.6 Barrier Penetrations.** Piping and conduit should pass over the top of the dike. Where penetration of the dike wall or floor is absolutely unavoidable, the penetration should be sleeved and sealed liquid tight.

**4.7 Access.** Provide access to the tanks, valves, and piping within the diked area. Safety regulations may require fixed stairs and handrails at the access points.

**4.8 Drainage Control.** Control drainage of water from diked areas to prevent contamination of natural watercourses, public sewers, or utilities. Locate drainage control points outside the diked area, protect them from physical damage, and be sure they are accessible under fire conditions. Grade the area within the dike away from the tank at a minimum slope of one inch per eight linear feet (one percent). The interior of the dike should drain to a collection sump, where storm water or other contained liquids can be siphoned or pumped over the dike wall. Liquid disposal is regulated by fire-safety and environmental agencies.

**WARNING: Retention of water within a diked area reduces the dike capacity and may cause unanchored tanks to float.**

**4.9 Oil/Water Separator.** If storm water is contaminated by petroleum, free-product can be skimmed from the collection sump and disposed of as waste, or processed in an oil/water separator. Oil/water separators rely on gravity to separate lighter-than-water oil globules from water. The performance



Personnel must be trained to recognize the warnings provided by the system and be prepared to take appropriate action in response to a warning. System designers, component manufacturers, suppliers, installers, and owner/operators should determine who is to do the training and when.

Local regulations often require notification if a release is detected. When new monitoring systems are installed, the owner should be trained in the appropriate response to an alarm signal. Advance knowledge by the owner of how the monitoring system operates can minimize disruption to operations.

## APPENDIX A SIZE CALCULATIONS FOR DIKES

**A.1 Volume Calculation.** The following calculations are a procedure for determining whether a diked area that encloses more than one tank has adequate capacity to contain a release. Where a diked area encloses more than one tank, deduct the volume of the tanks, other than the largest tank, below the top of the dike from the total capacity of the dike.

**A.2 Information Available.** The calculations that follow are based on the following example. Three tanks are to be contained in a dike. One is a 10,000-gallon capacity tank, nine feet in diameter and 21 feet long. Two are 6,000-gallon capacity tanks, eight feet in diameter and 16 feet long. To allow visual inspection of all tank surfaces and to provide space for piping and other equipment, space tanks three feet apart and three feet from the toe of the dike. The dike walls are assumed to be vertical. Calculations are illustrated for both vertical and horizontal tanks.

**A.3 Required Containment Volume.** The minimum containment volume required is equal to the volume that can be released into the diked area from the largest tank. Additional capacity may be required to retain rainwater or to provide an additional margin of safety. In this illustration, the additional required capacity has been established at 10 percent.

**Formula:** Volume of a cylinder  $V = \pi r^2 h$

**Where:**

$\pi = 3.14$

$r =$  radius in feet

$h =$  height in feet

**Therefore:**

$$V = 3.14 (4.5)^2 \times 21.00 = 1,335.3 \text{ cubic feet}$$

1,335.3 cubic feet is the maximum volume that can be released into the diked area.

In this case, a manufacturer's tank chart was available indicating that the actual capacity of the largest tank is 10,033 gallons. Using a conversion factor of 7.48 gallons per cubic

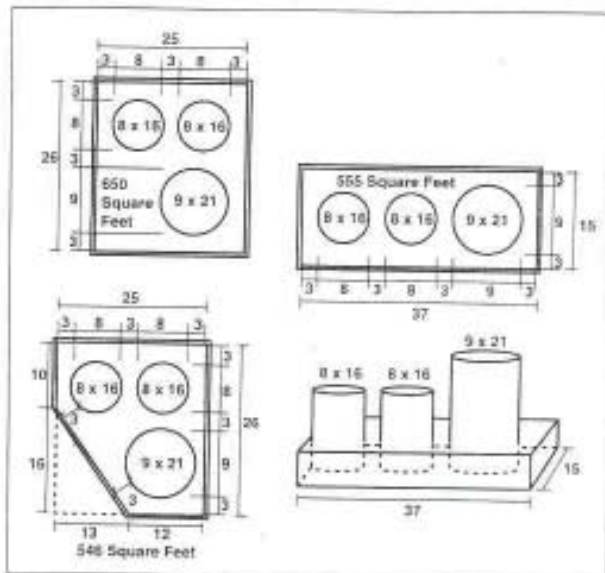


Figure 26. Alternate Vertical Tank Layouts.

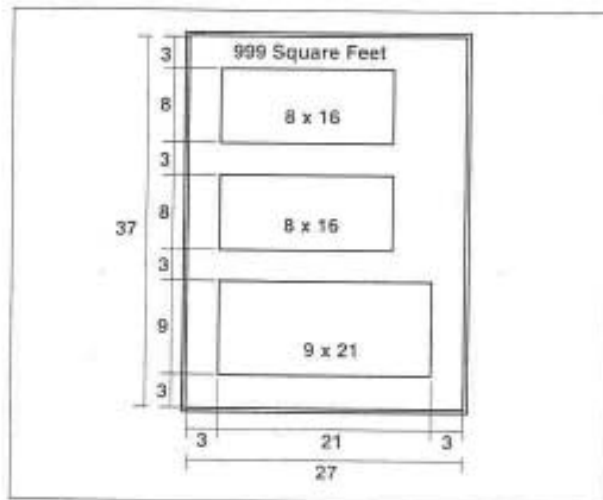


Figure 27. Horizontal Tank Layout.

foot, the calculated volume of the largest tank, based on the manufacturer's tank chart, is 1,341.3 cubic feet, which is slightly larger than our calculation, based on the tank dimensions. We will use the more conservative of the two values – 1,341.3 cubic feet – for our calculations.

Adding 10 percent to the dike capacity to accommodate rainwater, we determine that the containment required ( $V_c$ ) is 1,487.4 cubic feet.

$$V_c = 1,341.3 + 10 \text{ percent} = 1,475.4 \text{ cubic feet.}$$

**A.4 Vertical Tanks.** The shape of the diked area will depend upon what fits best on a particular site. A rectangular configuration was selected for our example.

**Formula:** Rectangular area =  $A = l \times w$

**Where:**

A = Area in square feet inside the dike

l = length in feet = 37'-0"

w = width in feet = 15'-0"

Gross containment area occupied = 37'-0" x 15'-0", or 555.0 square feet.

**A.5 Unavailable Capacity—Vertical Tanks.** The area occupied by tanks other than the largest tank ( $A_u$ ) is not available to contain a release and must be deducted from the area contained within the dike. In our example, the two 6,000-gallon-capacity tanks are eight feet in diameter.

**Formula:** Area of the base of a cylinder =  $A = \pi r^2$

**Therefore:**

$A_u = 3.14 (4.00)^2 \times 2 \text{ tanks} = 100.5 \text{ square feet}$

The net dike area available for containment is 555.0 minus 100.5, or 454.5 square feet.

**A.6 Calculation of Dike Height.** The required dike height can be calculated by dividing the required containment volume ( $V_c$ ) by the net containment area available.

**Where:**

Height of Dike Wall = H

$$H = \frac{V_c}{A - A_u} = \frac{1,475.4}{555.0 - 100.5} = 3.25 \text{ feet, or } 3'-3"$$

Dimension for containment installation.

Length = 37'-0"

Width = 15'-0"

Height = At least 3'-3"

**A.7 Horizontal Tanks.** Calculations used for horizontal tanks are similar to the calculations for vertical tanks. Again, it is necessary to determine the capacity of the tanks other than the largest tank below the height of the dike. The calculation of dike volume is the same for these horizontal tanks as for the vertical tanks.

**A.8 Horizontal Tank Dike Dimensions.** The required containment volume remains the same, 1,475.4, since the volume of the largest tank and the 10 percent allowance are unchanged. The tanks in this example are installed two inches above the dike floor and we selected a rectangular layout (see Figure 27). For this initial calculation of dike height, disregard the volume of the two smaller tanks below the top of the dike.

**Formula:** Rectangular area =  $A = l \times w$

**Where:**

A = Area in square feet inside the dike

l = length in feet = 37'-0"

w = width in feet = 27'-0"

H = Dike wall height

**Therefore:**

$A = 27'-0" \times 37'-0" = 999.00 \text{ square feet}$

$$H = \frac{1,475.4 \text{ cubic feet}}{999.0 \text{ square feet}} = 1.48 \text{ feet, or } 1'-6"$$

A dike wall height of 18 inches will contain the volume of the largest tank, plus 10 percent. Now we must take into consideration the volume of the two smaller tanks that is below the top of the dike. As previously stated, the tanks are raised two inches above the dike floor. Therefore, 16 inches of tank capacity for the two smaller tanks is below the top of the dike. This volume must also be contained by the dike and must be added to the required dike capacity.

**A.9 Unavailable Capacity—Horizontal Tanks.** The simplest way to calculate the volume of the smaller tanks that is below the top of the dike is to use the manufacturer's tank conversion chart to convert the height of the tank below the dike from inches to gallons, and then to cubic feet, using a conversion factor of 7.48 gallons per cubic foot. From the tank chart (see Table 3), we determine that the volume in each tank below the top of the dike is 663 gallons. This means that we must provide for 1,326 gallons ( $663 \times 2 = 1326$ ) of additional capacity, or 177.3 cubic feet ( $1,326 / 7.48 = 177.3$ ).

$$V_u = \frac{663 \text{ gallons} \times 2 \text{ tanks}}{7.48 \text{ gallons per cubic foot}} = 177.3 \text{ cubic feet}$$

Add the volume of the smaller tanks below the dike top to the required containment volume, and divide this by the area of the dike to obtain the new dike height:

$$H = \frac{(1,475.4 \text{ cubic feet} + 177.3 \text{ cubic feet})}{(999.0 \text{ square feet})}$$

$$H = 1.65 \text{ feet, or } 1'-8"$$

Length = 37'-0"

Width = 27'-0"

Height = At least 1'-8"  
(Rounded to the next higher full inch.)



**Table 6**  
**Pre-calculated Data**  
**Vertical Cylindrical Tanks**

TANK			WETTED AREA (Sq Ft)	REQ'D VENT CAPACITY (CFH)
CAPACITY (Gallons)	DIA. (Ft-In)	HEIGHT (Ft-In)		
280	36"	5'-2"	48	50,580
300	38"	5'-0"	49	51,640
500	48"	5'-5"	68	71,600
530	46"	6'-0"	72	75,800
550	48"	6'-0"	75	78,950
1,000	48"	10'-8"	134	140,700
1,000	64"	6'-0"	100	105,000
1,500	64"	9'-0"	151	158,550
2,000	64"	12'-0"	201	213,100
2,500	64"	15'-0"	251	239,520
3,000	64"	18'-0"	301	265,460
3,000	6'-0"	14'-0"	263	245,760
4,000	64"	24'-0"	402	312,840
4,000	6'-0"	19'-0"	358	291,840
5,000	8'-0"	13'-4"	335	281,100
6,000	8'-0"	16'-0"	402	312,840
8,000	8'-0"	21'-4"	536	367,680
10,000	8'-0"	27'-0"	678	420,080
10,000	9'-0"	21'-0"	593	389,340
10,000	10'-0"	17'-0"	534	366,920
10,000	10'-6"	15'-7"	514	359,320
12,000	8'-0"	32'-0"	804	463,240
12,000	9'-0"	25'-0"	706	430,040
12,000	10'-0"	20'-6"	644	407,840
12,000	11'-0"	17'-0"	587	387,060
15,000	8'-0"	40'-0"	1005	524,825
15,000	10'-6"	23'-5"	764	449,760
20,000	10'-0"	34'-2"	1073	536,045
20,000	10'-6"	31'-0"	1022	527,630
20,000	11'-0"	28'-0"	967	513,770
25,000	10'-6"	38'-6"	1269	567,350
30,000	10'-6"	46'-3"	1525	603,875

**Table 7**  
**Pre-calculated Data**  
**Horizontal Rectangular Tanks**

TANK				WETTED AREA (Sq Ft)	REQ'D VENT CAPACITY (CFH)
CAPACITY (Gallons)	LENGTH (Ft-In)	WIDTH (Ft-In)	HEIGHT (Ft-In)		
125	6'-8"	2'-9"	1'-0"	37	38,950
186	2'-8"	2'-8"	3'-6"	44	46,340
250	4'-4"	4'-0"	1'-11"	49	51,640
250	6'-8"	2'-9"	1'-11"	54	56,900
500	7'-6"	3'-0"	3'-0"	86	90,560
500	10'-0"	3'-6"	2'-0"	89	93,740
1,000	9'-8"	4'-8"	3'-0"	131	137,550
1,000	10'-0"	4'-7"	3'-0"	133	139,650
2,000	10'-2"	6'-11"	3'-10"	201	211,560
2,000	10'-8"	6'-4"	4'-0"	204	231,240
2,500	10'-2"	6'-11"	4'-9"	233	229,480
3,000	8'-6"	6'-10"	7'-2"	278	253,560
3,000	13'-9"	5'-5"	5'-5"	282	255,640
4,000	11'-4"	6'-10"	7'-2"	338	282,480
4,000	18'-2"	5'-5"	5'-5"	354	289,920
5,000	22'-9"	5'-5"	5'-5"	428	323,760
6,000	13'-8"	10'-10"	5'-5"	413	317,460
6,000	16'-5"	6'-10"	7'-2"	445	330,900
6,000	27'-4"	5'-5"	5'-5"	503	355,140
8,000	18'-2"	10'-10"	5'-5"	511	358,180
8,000	21'-11"	6'-10"	7'-2"	562	377,560
10,000	22'-10"	10'-10"	5'-5"	612	396,320
10,000	27'-5"	6'-10"	7'-2"	678	420,080
12,000	27'-4"	10'-10"	5'-5"	710	431,400
12,000	32'-11"	6'-10"	7'-2"	795	460,300

Source: Morrison Brothers Company, 1999 Edition

## **Article 7. – FLAMMABLE AND COMBUSTIBLE LIQUIDS**

**22-7-6 Flammable and combustible liquids; applications and checklists.** The state fire marshal shall make available on request applications, guidelines, checklists, procedures, applicable regulations and the like regarding the safe storage, use and sale of flammable and combustible liquids as well as the installation and maintenance of related tanks, piping, valves and dispensers. (Authorized by and implementing K.S.A. 1991 Supp. 31-133; effective May 10, 1993.)

**22-7-7 Approval of plans.** (a) Except as otherwise provided in this section, before the construction or modification of any installation for the storage, handling or use of flammable liquids is undertaken, drawings or blueprints made to scale shall be submitted to the state fire marshal with an application, all in duplicate, for approval. Within a reasonable time after receipt of the application with drawings or blueprints, the state fire marshal shall examine the plans and, if found to conform to applicable requirements of the Kansas Fire Prevention Code, shall signify approval of the application either by endorsement thereon or by attachment thereto, retain one copy for the files and forward the second copy to the Kansas Department of Health and Environment for their required approvals and eventual return to the requestor. If the drawings or blueprints do not indicate conformity with the applicable requirements of the Kansas Fire Prevention Code, the state fire marshal shall notify the applicant accordingly. Plans and applications shall be submitted postage paid to the address specified by the state fire marshal.

(b) The plans approval requirements applies to the following:

(1) Each new installation of tanks containing flammable or combustible liquids in the following amounts:

(A) Any state, county or local governmental unit installing tanks of 660 gallons or more capacity;

(B) any Industrial or Business company installing tanks of 660 gallons or more capacity;

(C) any agricultural farm installation of tanks of 1,100 gallons or more capacity; and

(D) any tank installed for the retail sale of flammable or combustible product through dispenser devices;

(2) any modifications to or replacements of tanks or piping at any establishment or facility meeting the requirements of (1); and

(3) any installation of new dispenser locations at any establishments or facility meeting the requirements of (1). This does not include the routine replacement of dispensers at existing sites.

(c) This plans approval requirements is in addition to any local jurisdiction requirements necessary to meet local zoning or permit approval and additional local requirements. In the event of a dispute as to whether or not the drawings or blueprints show conformity with the applicable requirements of these regulations, the local decision can be appealed to the state fire marshal in accordance with statutory provisions.

(d) All submitted drawings shall include the following minimum information:

(1) The name of the person, firm, or corporation proposing the installation, the location thereof and the adjacent streets or highways;

(2) for bulk plants, in addition to any applicable

features required under (4) and (5) of this section, the plot of ground to be utilized and its immediate surroundings, including any structures of value located on adjacent properties within 100 feet of the property line, on all sides, the complete layout of buildings, tanks, loading and unloading docks, and the types of construction of each building;

(3) for service stations, in addition to any applicable features required under (4) and (5) of this section, the plot of ground to be utilized and the complete layout of buildings, drives, and dispensing equipment;

(4) for above ground storage, the location and capacity of each tank, the dimensions of each tank, the class and name of liquid to be stored in each tank, the type of any tank supports, the types and sizes of normal and emergency valves, and the location of pumps and other facilities by which the tanks are filled or drained;

(5) in the case of underground storage, the location and capacity of each tank, the class and name of liquid to be stored in each tank, and the location of fill, gauge and vent pipes and openings; and

(6) in the case of installation for storage, handling or use of flammable liquids within the buildings or enclosures at any establishment or occupancy covered in this section, such detail as to show whether applicable requirements are met. (Authorized by and implementing K.S.A. 1991 Supp. 31-133; effective May 10, 1993.)

**22-7-8 Retroactivity.** (a) Kansas Fire Prevention Code regulations governing flammable and combustible liquids shall apply uniformly at all new or existing establishments and facilities in Kansas except as modified below. Requirements pertaining to operational practices and use of containers shall apply and be enforced at all new or existing establishments and facilities at or in which flammable or combustible liquids are stored, handled or used as of the effective date of these regulations.

(1) Physical installations shall apply and be enforced at all establishments and facilities erected, constructed, installed or first devoted to flammable or combustible liquid storage, handling or use on or after the effective date of these regulations.

(2) Establishments and facilities in existence prior to the effective date of these regulations shall comply with the following minimum requirements.

(A) The location or arrangement of buildings, tanks, platforms, docks, or spacing or clearances between these installations or between these installations and adjoining property lines, shall not be deemed to be distinctly hazardous and may be continued. When reconstruction or modernization of any noncomplying establishment or facility existing prior to the effective date of these regulations is undertaken, the elimination or correction of such nonconformity shall then be made in the course of such work.

(B) Lack of adequate emergency venting on any above ground tank, or lack of an operable fire valve at any tank opening below the liquid level on above ground tanks of more than 1,100 gallons or on any size above ground tank used for refueling at a service station, is deemed to be distinctly hazardous and shall be corrected or eliminated by no later than January 1, 1994 in all tanks except for crude oil tanks in oil fields, or tanks at refineries or marine or pipeline terminals.

(C) Lack of a liquid level gauge or a suitable means to prevent tank overfilling with the availability of appropriate conversion charts to determine the available capacity of a tank is deemed to be distinctly hazardous, and such system or means shall be installed and operable by no later than October 1, 1993.

(D) Lack of diking of existing above ground tanks to contain a fuel spill of at least 110 percent to the capacity of the largest tank is deemed to be distinctly hazardous, and such diking or containment shall be installed which contains the product at a location away from inhabited buildings

or places of high value by no later than January 1, 1994.

(E) Lack of breakaway devices on all dispenser hoses and the secure anchoring of dispensers is deemed to be distinctly hazardous, and such shall be installed, anchored and operable by no later than October 1, 1993.

(F) Lack of a properly installed fire valve underneath a dispenser in a pressurized piping system is deemed to be distinctly hazardous, and such device shall be installed immediately.

(G) Lack of a properly operating solenoid valve installed adjacent to any tank installed at an elevation which produces a gravity head on a dispensing device used to refuel vehicles and in the piping serving any such dispenser is deemed to be distinctly hazardous, and such valve shall be installed by no later than July 1, 1994, or at any prior date when such piping or dispenser is modified or replace.

(H) Lack of a fire valve or vacuum-activated anti-siphon valve installed underneath any suction type dispenser served by above ground tanks at an elevation that produces a gravity head on a dispensing device used to re-fuel vehicles is deemed to be distinctly hazardous, and either a fire valve or anti-siphon vacuum activated valve shall be installed by no later than July 1, 1994, or at any prior date when such piping or dispenser is modified or replaced.

(I) Lack of substantial collision protection at the end of dispenser islands is determined to be distinctly hazardous, and such protection shall be provided no later than January 1, 1994, or any prior date when dispenser island is modified or upgraded. (Authorized by and implementing K.S.A. 1992 Supp. 31-133; effective May 10, 1993.)

**22-7-9 Flammable and combustible liquid transfer responsibility.** Each individual conducting the transfer of flammable or combustible liquids from a transport vehicle to a storage tank governed by the Kansas Fire Protection Code shall verify the available capacity of the tank prior to starting any transfer operations, be in attendance during such operations and take the necessary steps to insure that overfilling does not occur. (Authorized by and implementing K.S.A. 1991 Supp. 31-133; effective May 10, 1993.)

**22-7-10 Emergency response training.** (a) Each employee involved in fuel transfer into motor vehicles at a retail service station, including attendants and cashiers of self-service stations,

upon employment and at least annually thereafter shall receive training from a responsible facility representative or industry organization on the proper procedures to be used in case of fire, overfill, or fuel spill situation. Such training shall include information regarding improper transfer of fuels, types of improper and illegal containers, and instruction of the proper use of fire extinguishers. Documentation of such training shall be maintained and shall be available for inspection upon request by a deputy state fire marshal.

(b) Each establishment or facility involved in fuel transfer into motor vehicles at retail service stations shall have emergency instructions covering fire, overfill or fuel spill procedures posted and readily available in the vicinity of all control consoles or attendant locations. Emergency telephone numbers shall be included on the instructions. The owner or designee of each establishment or facility is responsible for developing and posting the instructions. (Authorized by and implementing K.S.A. 1991 Supp. 31-133; effective May 10, 1993.)

**22-7-11 Connection of above ground tanks to dispensers used for refueling vehicles.** (a) Above ground tanks of no more than 12,000 gallons total capacity may be connected to a dispenser used for refueling vehicles if, by the determination of the state fire marshal, adequate safeguards, including distances to property of value, proper valving and dispenser protection are provided and a reasonable degree of safety is maintained.

(b) Local jurisdictions may supersede this approval through zoning, ordinance or permitting prohibitions against such installations. (Authorized by and implementing K.S.A. 1991 Supp. 31- 133; effective May 10, 1993.)

**22-7-12 Aboveground abandonment of underground tanks.** (a) Any underground tanks previously containing flammable or combustible liquids which are abandoned above ground shall be marked on two sides, in legible numbers not less than eight inches tall, the month, day and year the tank was first abandoned. The local fire department shall be notified of the location of any site where any group of tanks having a combined capacity of more than 12,000 gallons is abandoned.

(b) The tank owner shall be responsible for:

- (1) Purging the tank of vapors;
- (2) insuring that explosive concentrations of vapors cannot gather inside the tank; and
- (3) insuring that no opening of the tank is accessible to children.

(c) Tanks abandoned for more than twelve months shall then be rendered unusable by the tank owner by disassembly or other appropriate means which shall permit the free circulation of air throughout the tank.

(d) No underground tank shall be reinstalled for aboveground use without being certified for such use by meeting the requirements of UL standard 142 or equivalent. (Authorized by and implementing K.S.A. 1991 Supp. 31-133; effective May 10, 1993.)

## **Approval of Plans and Application Submittal**

Plans approval requirements apply to installations of tanks containing all flammable, combustible, and CERCLA Hazardous Substance liquids in the following amounts:

1. Any state, county, or local government unit or industrial or business occupancies installing tanks with a capacity of 660 gallons or more.
2. Any agricultural farm installation of tanks with a capacity of 1,100 gallons or more.
3. Any tank installed for the retail sale of flammable or combustible liquid product through a dispensing device.

ONCE THE APPLICATION IS APPROVED, A COMPLETE COPY WILL BE FORWARDED TO KDHE. KDHE WILL MAIL A STATEMENT REQUESTING PAYMENT FOR THE REGISTRATION OF THE TANK(S).

The requirements also apply to any modifications to or replacement of tanks or piping at any facility and any installation of new dispensing locations at a facility meeting the above requirements. This plan approval requirement is in addition to any local jurisdiction requirements.

THIS DOES NOT INCLUDE ROUTINE REPLACEMENT OF DISPENSERS AT EXISTING SITES.

Our objective is to formalize the code criteria into a unique format providing a “snap shot,” a small-scale facility plan with key information shown in a contextual form. The code footprint can reduce redundancy and increase coordination of effort among all involved with the new or modified construction. Drawing or blueprints of the proposed installation shall be made to scale and submitted with the application to the State Fire Marshal.

All drawings shall provide all distances and dimensions, in scale, of the following on a sheet of paper no larger than 11”x17”:

1. Facility name, location, adjacent streets and highways.
2. The plot of ground utilized and its surroundings including any structures of value located on adjacent properties within 100 feet of the property line. A complete layout of the tanks, loading and unloading docks or racks, dike requirements is needed including driveways, piping, dispensing equipment and all valves and vents.
3. Location, capacity, dimensions of each tank and name and class of liquids stored.

KSFM Reference \_\_\_\_\_

KDHE Reference \_\_\_\_\_



# Kansas State Fire Marshal's Office

## ABOVEGROUND STORAGE TANK SYSTEM APPLICATION

Petroleum Products and CERCLA Hazardous Substances

### I. FACILITY INFORMATION:

A. Facility Name:			
Facility Street Address:		B. Facility Mailing Address:	
C. Contact Person:		Contact Phone Number:	
D. Tank Location (if located at different address)		County:	
		E. Qtr Section _____ Section _____ Circle one: Township _____ S. Range _____ E / W	
F. Number of aboveground tanks already at this location: _____		G. Number of underground tanks already at this location: _____	
H. Are tanks to be taken out of service because of this new installation? Yes _____ No _____			
I. If any failures have occurred, please briefly describe the incident:			
J. Type of Usage:			
Private		Industrial	Bulk Site
Public		Self Service	Cardtrol
Agriculture		Full Service	Keytrol
			Other
Hours of Operation			

### II. TANK OWNER INFORMATION

A. Owner Name:			
B. Owner Address:		State	County
			ZIP + 4
C. Contact Person:		D. Phone Number:	
		E. Fax Number:	
F. Owner Type: Government _____ Industrial/Business _____ Farm _____ Retail _____			

### III. CONTRACTOR/INSTALLER INFORMATION:

A. Contractor/Installer Name:			
B. Address:		State	County
			ZIP + 4
C. Contact Person:		D. Phone Number:	
		E. Fax Number:	

Submit completed applications to the Kansas State Fire Marshal's Office, 700 SW Jackson Street, Suite 600, Topeka, KS, 66603.

DO NOT INCLUDE CHECK FOR PAYMENT OF KDHE REGISTRATION FEES WITH THIS FORM.

#### IV. TANK INFORMATION:

(Duplicate as needed)

Tank Number	Tank_____	Tank_____	Tank_____	Tank_____
Tank UL Number API Number				
Capacity in Gallons				
Tank Dimension Length & Width				
Single Wall Or Double Wall				
Type of Product				
Manufacturer				
Type of Dike Construction				
Dike Size LxWxH				
Dike Capacity (in gallons)				
Emergency Vent Size				
Atmospheric Vent Size				
Orientation (Horiz/Vert)				
Year Installed				
Age of Tank				
Corrosion Protection				

**All tanks shall be painted and display clear product identification in 3-inch (minimum) letters. The NFPA 704 MARKING SYSTEM may also be required, depending on product hazard classification, local requirements, or tank locations.**

**A weather-proof sign with contact persons and emergency numbers will be posted on site with a minimum of 3-inch letters in plain view. (Keytrol or Cardtrol locations)**

**If product stored is NOT a petroleum product but a flammable or combustible or hazardous substance, please provide CERCLA name or CAS registration number and the Material Safety Data Sheet. Attach a copy to application.**

## V. TANK INFORMATION

1. How will the surface runoff be removed from the dike area?	
2. How will leaked product be removed from the dike? (Water and leaked product cannot be removed in the same way.)	
3. Are tanks equipped with spill prevention? Yes _____ No _____	Manufacturer Name & Model Number:
4. Are tanks equipped with overfill prevention? Yes _____ No _____	Manufacturer Name & Model Number:
5. What type of approved foundation will the tank rest on?	
6. Answer the following questions in nearest FEET the tanks are adjacent to:	
A. _____ feet from the nearest building on same property B. _____ feet from the nearest property line C. _____ feet from the nearest residence	D. _____ feet from public street E. _____ feet from tanks to bulk load out F. _____ feet from dispensers from aboveground tanks
7. Describe type of security for site (if required):	
8. Does electrical wiring comply with local and the National Electrical Code 70? Yes _____ No _____	
9. <b>Proposed Installation Date:</b> _____	

## VI. PIPING INFORMATION

All piping must comply with NFPA 30

Type of lines: Material:	Diameter	Length
Is any of the piping underground? Yes _____ No _____ If yes, is buried piping equipped with swing joints to prevent damage from frost heave? Yes _____ No _____		
Are below-ground lines contained in concrete trough with removal covers? Yes _____ No _____		
Corrosion Protection: method installed _____		
Fusible link valves: Internal _____ External (with shear section) _____		
Pressure system: emergency shut-off valves with a shear valve section securely anchored under each dispenser? Yes _____ No _____ Type installed: _____		
Suction system: Are vacuum actuated shut-off valves with shear suction securely anchored under each dispenser? Yes _____ No _____ Type installed _____		

## VII. DISPENSER INFORMATION

All dispensers must comply with NFPA 30A

Are emergency breakaway devices provided on all dispensing hoses? Yes _____ No _____
All dispensers securely anchored and have collision protection installed? Yes _____ No _____
Type of Dispenser(s): Pressurized _____ Conventional Suction _____ Safe Suction _____
Are pressurized lines equipped with: Flow Restrictor? _____ Automatic Shutoff? _____ Continuous Alarm? _____ Automatic Alarm Monitor? _____

## VIII. PLANS

Plans should document the location of the tanks, lines, monitoring equipment, nearby structures, and property boundaries. Provide a separate detailed drawing of tank, piping, valves, and dispenser locations. Submit a complete application and plans to the Kansas State Fire Marshal's Office for approval. A minimum of twenty (20) working days prior to the anticipated installation date must be allowed for sufficient time to review the plans. Once approval is completed, a copy will be forwarded to KDHE for registration. Please submit plans on sheets of paper no larger than 11x17. Drawings do not have to be to scale; however, they must detail the required information.

## IX. APPLICANT'S CERTIFICATION

I CERTIFY THAT THE INFORMATION ABOVE IS TRUE TO THE BEST OF MY KNOWLEDGE AND THAT ALL EQUIPMENT WILL BE INSTALLED IN COMPLIANCE WITH THE MANUFACTURER INSTALLATION REQUIREMENTS. THIS INSTALLATION WILL BE PERFORMED IN COMPLIANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

Owner's Signature \_\_\_\_\_

Date \_\_\_\_\_

Contractor's Signature \_\_\_\_\_

Date \_\_\_\_\_



ITEM #	SAFETY FEATURE	CODE CITE	DESCRIPTION	
APPLICABLE STATUTES AND REGULATIONS GENERAL REQUIREMENTS				
INFO	Authority to Inspect	KSA 31-133(1)	The state fire marshal shall adopt reasonable rules and regulations for the keeping, storage, use, sale, handling, and transportation of highly flammable materials.	
INFO	Definitions		<p><b>AST:</b> Above Ground Storage Tank</p> <p><b>Public Accessed Service Stations:</b> Service stations which the general public can utilize for the purpose of retail sale of fuels into motor vehicles</p> <p><b>Full Service Station:</b> Service station in which all fuel transfer is conducted by the owner/operator or employee.</p> <p><b>Attended Self-Service Station:</b> Service stations in which fuel transfer is conducted by the general public under the supervision of the owner/operator or employees.</p> <p><b>Unattended Self-Service Station:</b> Service station in which fuel transfer is conducted by the general public without supervision like that of an attended self-service station.</p> <p><b>New facility:</b> Established or installed prior to the effective date of current regulations, May 10, 1993.</p> <p><b>Existing facility:</b> Established or installed prior to the effective date of current regulations, May 10, 1993.</p> <p><b>Class I Flammable Liquid:</b> Typically a liquid with a flash point below 100 degrees F; examples include gasoline and aviation fuels.</p> <p><b>Class II Flammable Liquid:</b> Typically a liquid with a flash point at or above 100 degrees F and below 140 degrees F; examples include #1 and #2 diesel heating oil.</p>	

ITEM #	SAFETY FEATURE	CODE CITE	DESCRIPTION	
<b>STORAGE REQUIREMENTS</b>				
A-1	APPROVED STORAGE TANKS	90-30/2-2	<p>Flammable/combustible liquids shall be stored in approved aboveground or underground storage tanks and listed for their current use.</p> <p>NOTE: Some existing tanks may not have a label and can be accepted for use provided they have proper atmospheric and emergency venting and a fire valve on piping below the liquid level.</p>	<b>6 MONTHS – requires an application and plan submittal</b>
A-2	TANK LOCATION	KAR 22-7-8(a)(2)(A) 90-30/2.3.1.1	<p>NEW installations, after May 1993, must have prior KSFM approval. (Documentation <u>should</u> be available for inspector verification.)</p> <p>Location of EXISTING tanks to buildings, docks, or property lines <b>IS NOT</b> deemed distinctly hazardous and can continue. As determined by the inspector.</p>	<b>60 DAYS</b>
A-3	EMERGENCY VENTING	KAR 22-7-8(a)(2)B 90-30/2-3.5.1	<p>Emergency venting shall be provided for:</p> <ol style="list-style-type: none"> <li>1) any size AST used for retail refueling of vehicles, or</li> <li>2) any other AST of 660 gallons or more capacity, or</li> <li>3) any existing AST of 1,100 gallons or more used for storage of Class I &amp; II liquids.</li> </ol>	<b>6 MONTHS</b>
A-4	TANK GAUGING	KAR 22-7-8(A)(2)C	<p>Tank gauging shall be provided for:</p> <ol style="list-style-type: none"> <li>1) any size AST used for retail refueling of vehicles, or</li> <li>2) any other tank of 660 gallons or more capacity, or</li> <li>3) any existing AST of 1,100 gallons or more</li> </ol> <p>They shall have a liquid level gauge, or provide a suitable means to prevent overfilling of the tank. “Sticking” of tank is permitted as long as conversion charts are available on-site.</p>	<b>60 DAYS</b>

ITEM #	SAFETY FEATURE	CODE CITE	DESCRIPTION	
A-5	CONTAINMENT DIKING	KAR 22-7-8(A)(2)D	Containment diking shall be provided for:  1) any size AST used for retail refueling of vehicles, or 2) any other tank of 660 gallons or more capacity.  Containment capacity shall be 110% of the volume of the largest tank; i.e. 10,000 g tank shall have containment for 11,000 g. Helps: 1 gallon = 231 cubic inches; 1 cubic foot of storage = 7.48 gallons.	4 MONTHS
A-6	TANK FOUNDATION	90-30/2-6	Tanks shall rest on the ground or on foundations made of concrete, masonry, or steel. Piling or steel supports with over 12 inches exposed shall have a fire resistance of not less than 2 hours. Existing supports may remain as is, if they do not constitute a distinct life safety hazard, i.e. close by populated areas or waterways.	6 MONTHS
A-7	MAXIMUM SIZE AST TO CONNECT TO SERVICE-STATION DISPENSERS	KAR 22-7-11	Aboveground tanks of no more than 12,000 gallons may be connected to a dispenser used for refueling vehicles if installation complies with KSFM requirements or if the inspector determines that adequate safeguards and a reasonable degree of safety is maintained.	6 MONTHS
A-8	ATMOSPHERIC VENTING	90-30/2-1.2 90-30A/2-1.2 90-30	Vent pipes on all aboveground and underground storage tanks shall be 12 feet above grade level and in a clear area away from eaves or openings where vapors could accumulate.	3 MONTHS
A-9	CORROSION PROTECTION	90-30/2-6.1	Storage tanks shall be properly protected and maintained against corrosion.	6 MONTHS
A-10	TANKS LIQUID TIGHT	90-30/2-8.6	All tanks shall be maintained liquid tight with no leaks or seepage.	30 DAYS
A-11	PRODUCT IDENTIFICATION	90-30/2-9.3	All aboveground storage tanks shall have product or contents clearly marked and visible on each tank. (Either NFPA 704 HAZARDOUS MATERIALS diamond marking or contents name are acceptable.)	3 MONTHS

**KANSAS STATE FIRE MARSHAL  
FLAMMABLE/COMBUSTIBLE LIQUID**

**CHECKLIST 90-30  
PAGE 4 OF 9**

ITEM #	SAFETY FEATURE	CODE CITE	DESCRIPTION	
A-12	WEEDS/ COMBUSTIBLES	90-30/5-5.3.4 90-30/2-3.3.3(i)	All facilities shall be kept free of weeds, trash, and unnecessary combustibles. Combustible storage, weeds or grass, or empty or full drums are not permitted in any diked area.	30 DAYS
A-13	MANUAL/FUSIBLE FIRE VALVES	KAR 22-7- 8(a)(2)B 30-3-3.3	1100 gallon AST or more, or any AST used for vehicle refueling shall have either an internal or external manual/fusible link fire valve installed in or immediately adjacent to any opening below level through which liquid can flow.	3 MONTHS
<b>TRANSFER REQUIREMENTS - GENERAL</b>				
A-14	PIPING – MATERIALS LIQUIDTIGHT	90-30/3-2.2	A piping system that is leaking constitutes a distinct hazard and shall be emptied of liquid or repaired in acceptable manner. This includes pumps and loading racks.	30 DAYS
A-15	PIPING – PROTECTED/ SUPPORTED	90-30A/3-3 90-30/3-5	All piping shall be protected from physical damage and shall be substantially supported.	3 MONTHS
A-16	PIPING – CORROSION PROTECTION	90-30/3-6	All exposed piping shall be protected against corrosion.	3 MONTHS
A-17	CHECK VALVES	90-30/3.7	All transport unloading lines attached to any AST below the liquid level shall be equipped with a backflow check valve.  NOTE: If loading and unloading is done through a common pipe, a backflow check valve is not required, provided they have an accessible block valve.	6 MONTHS
A-18	PIPING IDENTIFICATION	90-30A/3-9	All fill lines shall be clearly marked or color coded for product identification.	60 DAYS
<b>TRANSFER REQUIREMENTS – SERVICE STATION DISPENSERS (GENERAL)</b>				
A-19	DISPENSER LOCATION	90-30a/4-1.1	Dispensers shall be so located that all parts of the vehicle being fueled will be on the premises of the service station.	1 YEAR
A-20	DISPENSER EMERGENCY SHUT-OFF	90-30A/4-1.2	A clearly identified and easily accessible switch or circuit breaker shall be provided at a location remote from service station dispensing devices which will shut off the power to all dispensers in the event of an emergency.	6 MONTHS

ITEM #	SAFETY FEATURE	CODE CITE	DESCRIPTION	
A-21	<b>CLASS I/CLASS II LIQUIDS – ACCIDENTAL DISCHARGE</b>	<b>90-30A/4-2.1</b>	Class I and Class II liquids shall be transferred only through fixed pumps designed and equipped to allow control of flow and prevent leakage and accidental discharge.	<b>60 DAYS</b>
A-22	<b>DISPENSERS – APPROVED</b>	<b>90-30A/4-22</b>	Dispensing devices for Class I and II fuels must be listed and approved by a testing laboratory.	<b>3 MONTHS</b>
A-23	<b>DISPENSER CONTROLS</b>	<b>90-30A/4-2.3</b>	A control shall be provided that will permit the pump to operate only when a dispensing nozzle is removed from its bracket or normal position. This control shall also stop the pump when nozzles are returned to their storage position. Any satellite dispensers must meet dispenser requirements. No double-hoses (tee) from a single dispenser outlet are permitted.	<b>3 MONTHS</b>
A-24	<b>DISPENSER – COLLISION PROTECTION</b>	<b>KAR 22-7-8(A)(2)I</b>	Dispensing devices shall be protected by substantial collision protection at the ends of the dispensing islands.	<b>6 MONTHS</b>
A-25	<b>DISPENSER – ANCHORED</b>	<b>KAR 22-7-8(a)(2)I 90-30A/4-2.5</b>	All dispensers shall be mounted on a concrete island and securely bolted in place.	<b>6 MONTHS</b>
A-26	<b>AST SERVICE STATION – SOLENOID VALVE TO DISPENSERS</b>	<b>KAR 22-7-8(a)(2)G</b>	If an AST is installed at an elevation which produces a gravity head on a service station dispensing device used to refuel vehicles, it shall have an electric solenoid valve installed adjacent to and downstream from the fire valve.	<b>6 MONTHS</b>
A-27	<b>DISPENSER – PRESSURIZED PIPING SYSTEM FIRE/IMPACT VALVE</b>	<b>KAR 22-7-8(a)(2)F 90-30A/4-3.6</b>	A rigidly anchored emergency shut-off valve, incorporating a fusible link and designed to close automatically in case of severe impact or fire, shall be installed under all dispensers with pressurized piping systems (pump located at or in the storage tank).	<b>6 MONTHS</b>
A-28	<b>AST SUPPLIED DISPENSER – VACUUM ACTUATED ANTI-SIPHON VALVE</b>	<b>KAR 22-7-7(a)(2)</b>	A vacuum-actuated siphon valve shall be installed and rigidly anchored under all dispensers served by AST which creates a gravity head at the dispenser.  NO FIRE VALVE IS REQUIRED IF IT IS A SAFE SUCTION SYSTEM CONNECTED TO UNDERGROUND TANKS OR IF THE AST IS BELOW THE LEVEL OF THE DISPENSER.	<b>6 MONTHS</b>

**KANSAS STATE FIRE MARSHAL  
FLAMMABLE/COMBUSTIBLE LIQUID**

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ITEM #	SAFETY FEATURE	CODE CITE	DESCRIPTION	
A-29	DISPENSER – HOSE	90-30A/4-2.6	Dispenser hose length shall not exceed 18 ft. in length and shall be listed by approved testing laboratory. Cracked or leaking hose shall be replaced.	30 DAYS
A-30	DISPENSER – HOSE EMERGENCY BREAKAWAY DEVICE	KAR 22-7-8(2)E	A listed emergency breakaway device shall be installed on all dispensing hoses. When equipped with a retriever, the breakaway device shall be installed between the place where the retriever attaches to the hose and the nozzle.	30 DAYS
A-31	DISPENSER – AUTOMATIC NOZZLES	90-30A/9-1.2	All nozzles shall be the automatic closing type nozzle with or without a latch open device and shall be approved by an approved testing laboratory.	30 DAYS
A-32	DISPENSER – EMERGENCY SHUT-OFF	90-30A/4-1.2	A clearly identified and easily accessible switch or circuit breaker shall be provided at a location remote that will shut off the power to all dispensers in the event of an emergency.	3 MONTHS
<b>O – OPERATIONS</b>				
A-33	EMERGENCY TRAINING	KAR 22-7-10	(a) Each employee involved in fuel transfer into motor vehicles at a retail service station shall be trained in proper procedures in case of fire, overfill, or fuel spill situation. Training shall include handling improper transfer of fuel, types of improper and illegal containers, and instruction on the proper use of a fire extinguisher. Document the training and maintain records for inspection upon request. (b) Retail service stations shall have emergency instructions covering fire, overfill, or fuel spill procedures posted and readily available in the vicinity of all control consoles or attendant locations.	
<b>O – OPERATIONS (LOADING/UNLOADING RACK)</b>				
A-34	FLEXIBLE HOSE	90-39/5-4.4.1.6	Listed flexible hose may be used where vibration exists and at loading racks for fill lines. Hoses shall be free of cracking, checking or cuts.	60 DAYS
A-35	LOADING/ UNLOADING LOCATION	90-30/5-4.4.1.1	Tank vehicle loading and unloading facilities shall be separated from aboveground tanks, buildings and property lines by a distance of at least 25 feet for Class I liquids and 15 feet for Class II liquids measured from the nearest transfer connection.	1 YEAR

ITEM #	SAFETY FEATURE	CODE CITE	DESCRIPTION	
A-36	TRANSPORT UNLOADING	KAR 22-7-9	Any individual conducting the transfer of flammable or combustible liquids from a transport vehicle to a storage tank governed by the Kansas Fire Prevention Code shall verify the available capacity of the tank prior to starting transfer operations.	
A-37	STATIC PROTECTION	90-30/5-4.4.1.2	Provide proper bonding at all facilities where tank vehicles are loaded through open domes. Grounding cable must be attached to a solid ground, i.e. a grounding rod. Grounding to loading rack will not provide a sufficient ground.	30 DAYS
A-38	CONNECTION OF STATIC BOND	90-30/5-4.4.1.4	Bonding connection shall be made to the tank vehicle BEFORE dome covers are raised and shall remain in place until filling is complete and all dome covers are closed and secured.	30 DAYS
A-39	FINAL CONTROL FLOW VALVES	90-30/5-4.4.1.10	When top loading a tank vehicle with Class I or Class II liquids, the final control valve shall be of the self-closing type and be manually held open except where automatic means are provided to prevent overfilling.	6 MONTHS
A-40	DOWNSPOUTS – LOADING RACK	90-30/5-4.4.1.6	When filling into open domes of tank vehicles, transfer shall be through a downspout which extends to near the bottom of the tank.	6 MONTHS
<b>PREVENTION</b>				
A-41	FIRE EXTINGUISHER	90-30A/9.8 90-10/4-4.1	Each service station shall provide at least one 40 BC rated fire extinguisher. NOTE: Convenience stores shall have at least one 2A-40BC rated fire extinguisher. Extinguishers shall be maintained annually by a licensed firm.	30 DAYS
A-42	SIGNAGE	90-30A/9-9	Islands dispensing Class I liquids shall have warning signs with the following equivalent wording: (1) NO SMOKING (2) STOP ENGINE (3) IT IS UNLAWFUL AND DANGEROUS TO DISPENSE GASOLINE INTO UNAPPROVED CONTAINERS. Islands dispensing ONLY Class II liquids shall have “NO SMOKING” signs.	30 DAYS

ITEM #	SAFETY FEATURE	CODE CITE	DESCRIPTION	
A-43	ELECTRICAL EQUIPMENT	90-30A/7.1	Electrical equipment where Class I liquids are stored, handled, or dispensed shall be in an explosive-proof conduit with no exposed wiring or open boxes.	3 MONTHS
A-44	HEATING EQUIPMENT	90-30A/8.1	Where an open flame or electrical arc located in an area where Class I liquids are dispensed or transferred shall have 1-hour fire-rated separation or be located at least 8 ft. above floor level. In lubrication or service rooms where no Class I liquids are dispensed or transferred, heating equipment shall be located at least 18 inches above floor level and must be protected from physical damage.	3 MONTHS
<b>ATTENDED SELF-SERVICE STATIONS ADDITIONAL REQUIREMENTS</b>				
A-45	ATTENDANT PRESENT	90-30A/9-4.3	All attended self-service stations shall have at least one attendant on duty while station is open for business.	30 DAYS
A-46	EMERGENCY SHUT-OFF	90-30A/9-4.5	All attended self-service stations shall provide an emergency shut-off control at the attendant's console.	3 MONTHS
A-47	CLEAR VIEW OF DISPENSING AREA	90-30A/9-4.7	The dispensing area shall at all times be in clear view of the attendant OR shall have a two-way intercom which monitors island activity.	6 MONTHS
<b>UNATTENDED SELF-SERVICE STATIONS ADDITIONAL REQUIREMENTS</b>				
A-48	EMERGENCY SHUT-OFF	90-30A/9-5.3	All unattended self-service stations shall provide emergency controls to shut off all power to all dispensing devices and shall be located 20 feet from, but within 100 feet of, the dispensers.	6 MONTHS



ITEM #	SAFETY FEATURE	CODE CITE	DESCRIPTION	
A-49	OPERATING/ EMERGENCY INSTRUCTIONS	90-30A/9-5.4 90-30A/9-5.5	Operating and emergency instructions shall be posted and visible in the dispensing area and shall include the following information:  1) Location of emergency shut-off (unless obvious), and 2) Location of fire extinguisher (unless obvious), and 3) Emergency instructions which incorporate the following or equivalent wording: Company Name IN CASE OF FIRE OR SPILL Use emergency shut-off Report to: (Company emergency telephone number) (Local fire department telephone number)	30 DAYS
A-50	FIRE EXTINGUISHER	90-30A/9-8 90-10/4-4.1	A minimum 40BC rated fire extinguisher shall be available for use within 100 ft of the dispenser site. Extinguishers shall be maintained annually by a licensed firm.	30 DAYS